T0280-068E60

FIG. 1

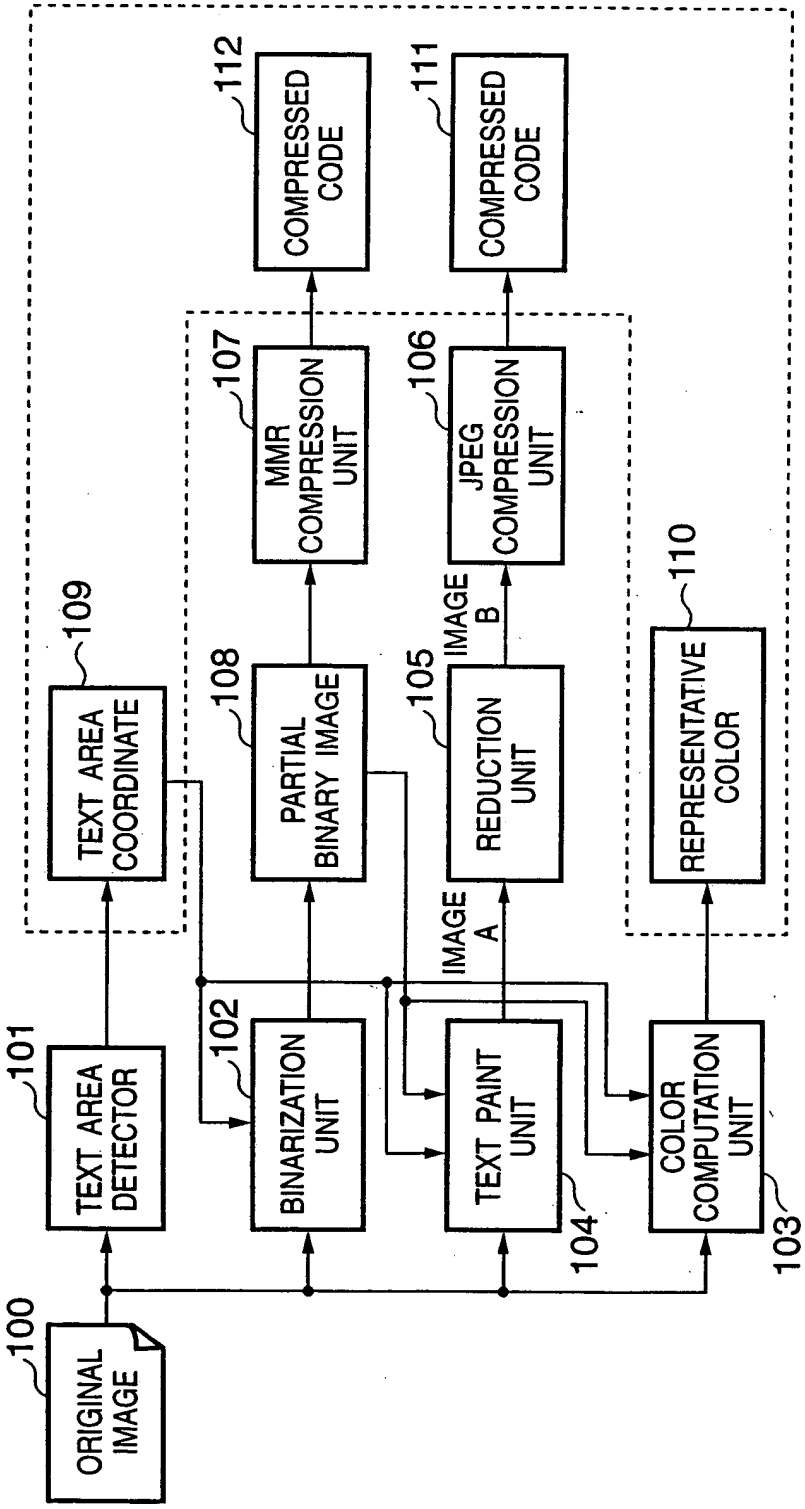


FIG. 2

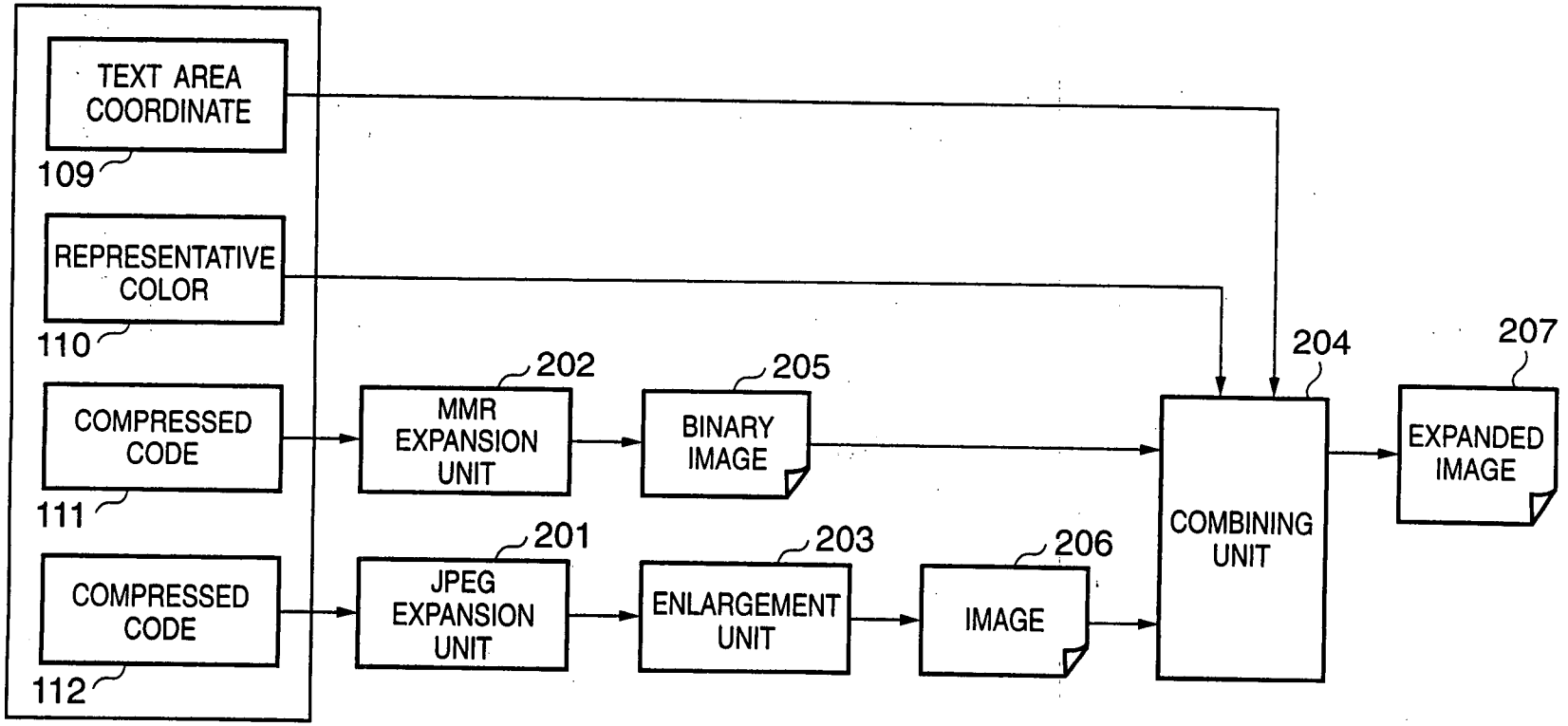

TEXT AREA COORDINATE
109
REPRESENTATIVE COLOR
110
COMPRESSED CODE
111
COMPRESSED CODE
112
202
MMR EXPANSION UNIT
205
BINARY IMAGE
201
JPEG EXPANSION UNIT
203
ENLARGEMENT UNIT
206
IMAGE
204
COMBINING UNIT
207
EXPANDED IMAGE

FIG. 3

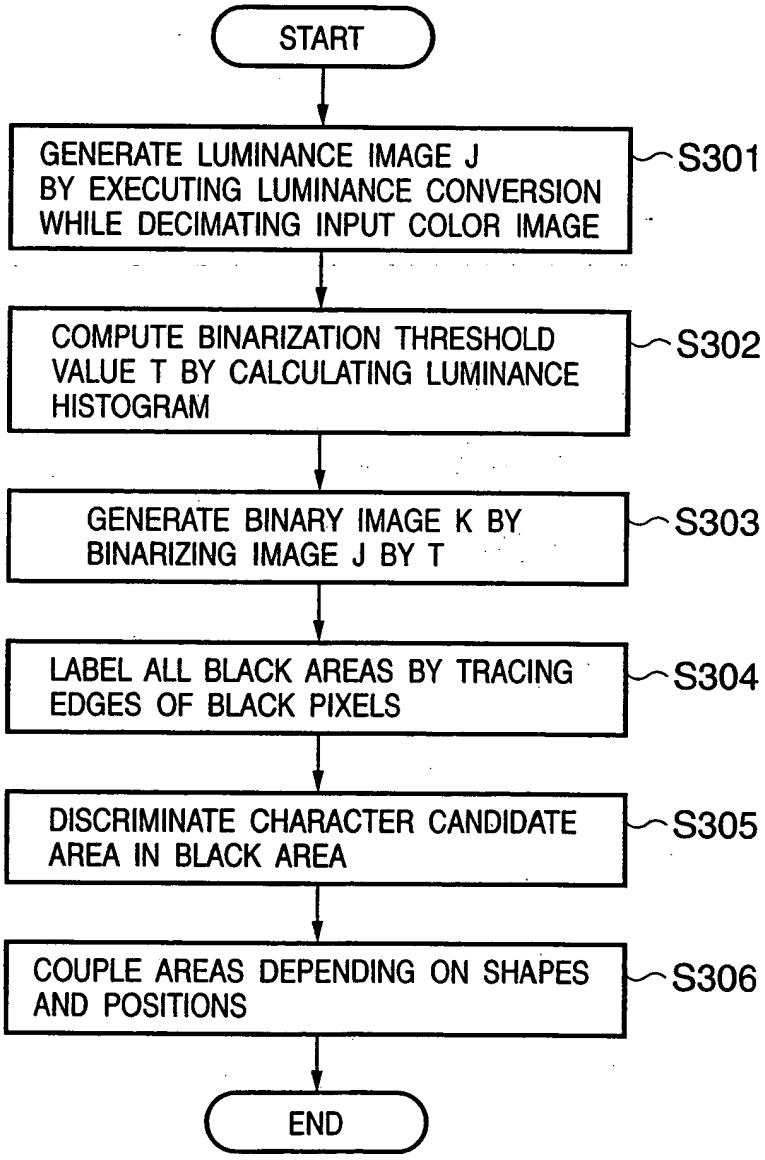
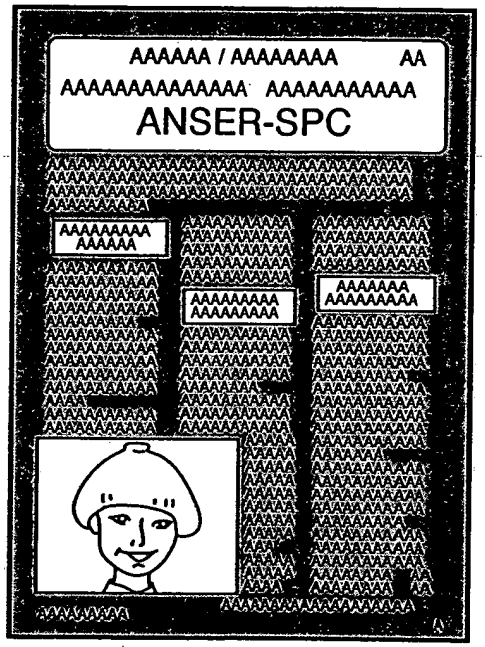

START
GENERATE LUMINANCE IMAGE J BY EXECUTING LUMINANCE CONVERSION WHILE DECIMATING INPUT COLOR IMAGE
S301
COMPUTE BINARIZATION THRESHOLD VALUE T BY CALCULATING LUMINANCE HISTOGRAM
S302
GENERATE BINARY IMAGE K BY BINARIZING IMAGE J BY T
S303
LABEL ALL BLACK AREAS BY TRACING EDGES OF BLACK PIXELS
S304
DISCRIMINATE CHARACTER CANDIDATE AREA IN BLACK AREA
S305
COUPLE AREAS DEPENDING ON SHAPES AND POSITIONS
S306
END

FIG. 4



ORIGINAL IMAGE

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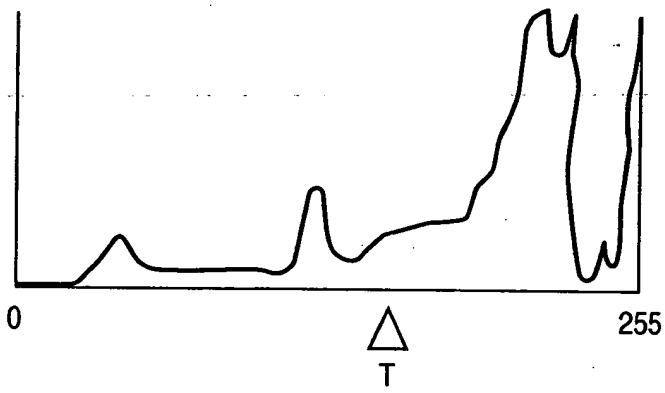
FIG. 5



LUMINANCE HISTOGRAM

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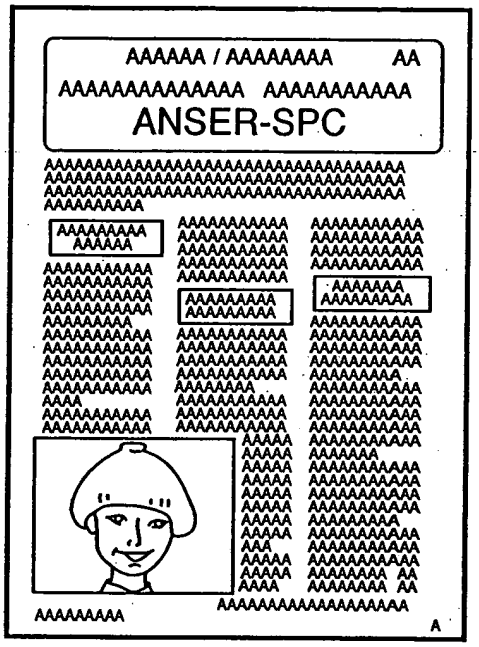
FIG. 6



BINARY IMAGE K

FIG. 7

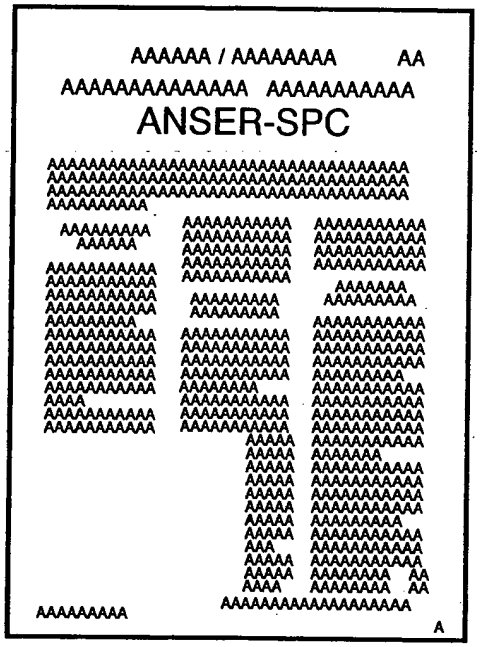


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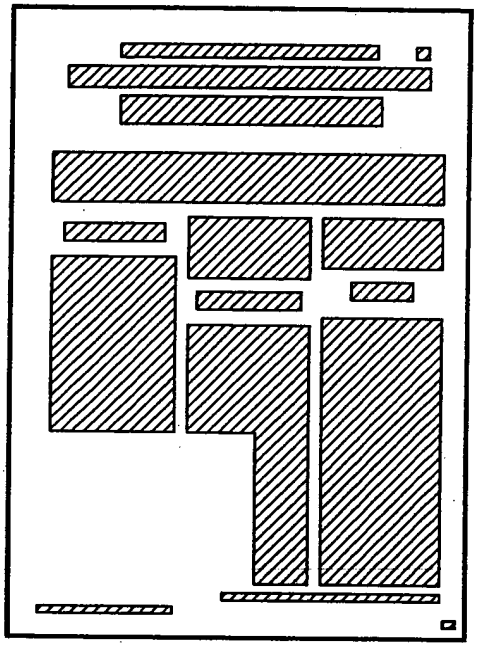
FIG. 8



EP 0 280 068 A2

FIG. 9

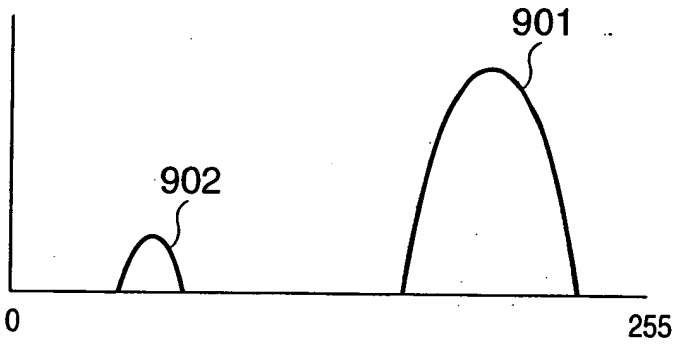


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FIG. 10A

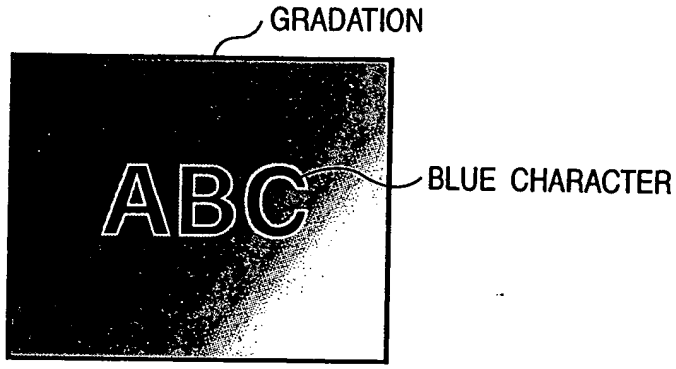


FIG. 10B

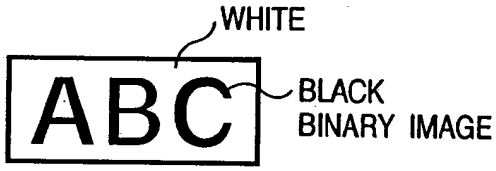
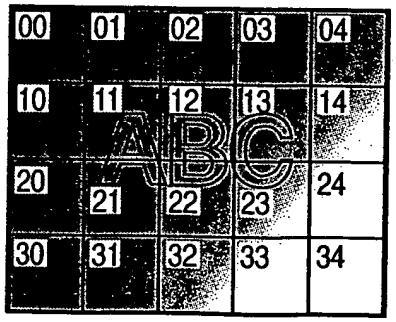


FIG. 10C



T00230 06675660

FIG. 11

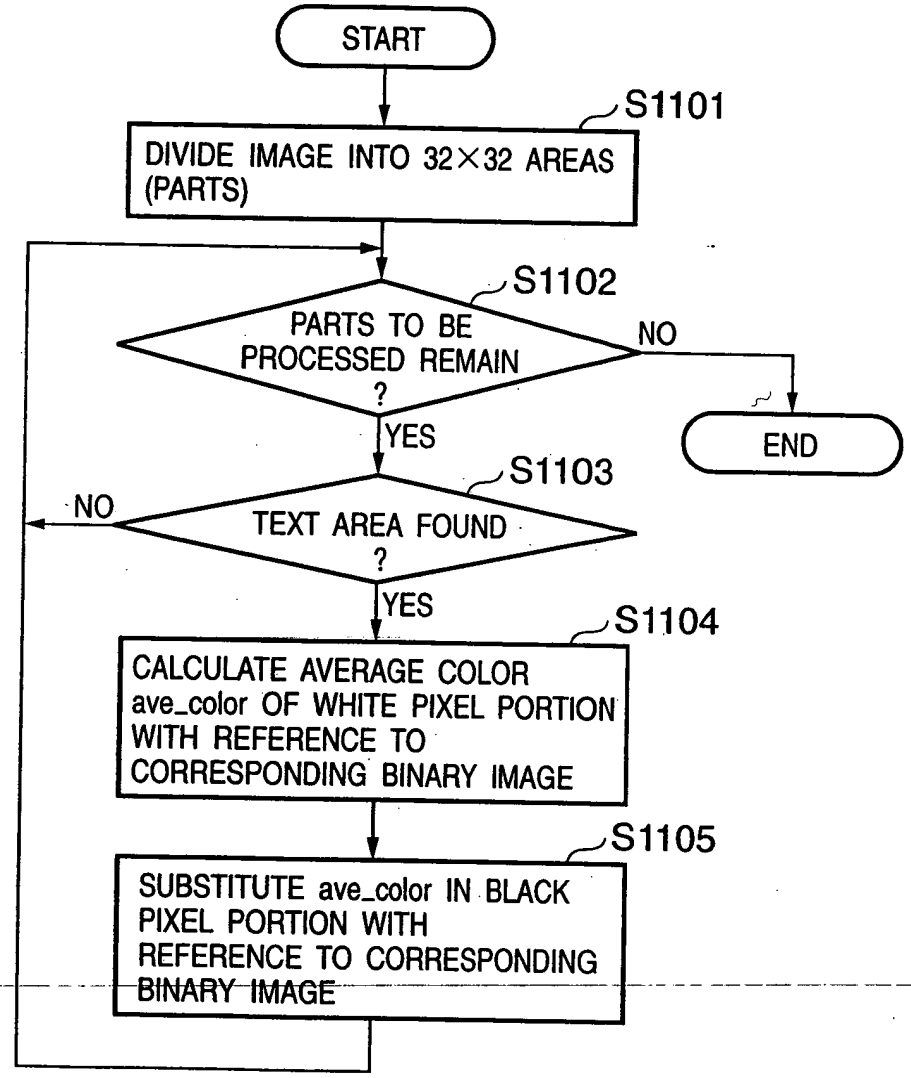

START
S1101
DIVIDE IMAGE INTO 32×32 AREAS (PARTS)
S1102
PARTS TO BE PROCESSED REMAIN ?
NO
END
YES
S1103
NO
TEXT AREA FOUND ?
YES
S1104
CALCULATE AVERAGE COLOR ave_color OF WHITE PIXEL PORTION WITH REFERENCE TO CORRESPONDING BINARY IMAGE
S1105
SUBSTITUTE ave_color IN BLACK PIXEL PORTION WITH REFERENCE TO CORRESPONDING BINARY IMAGE

FIG. 12

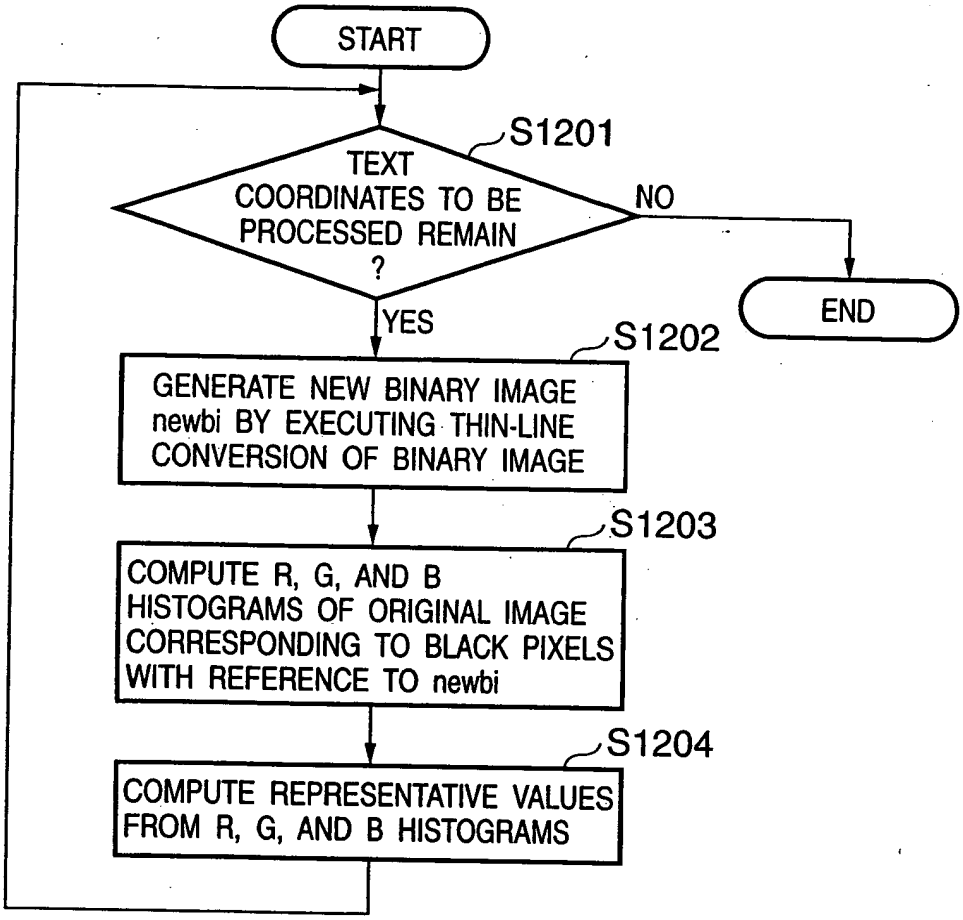


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FIG. 13

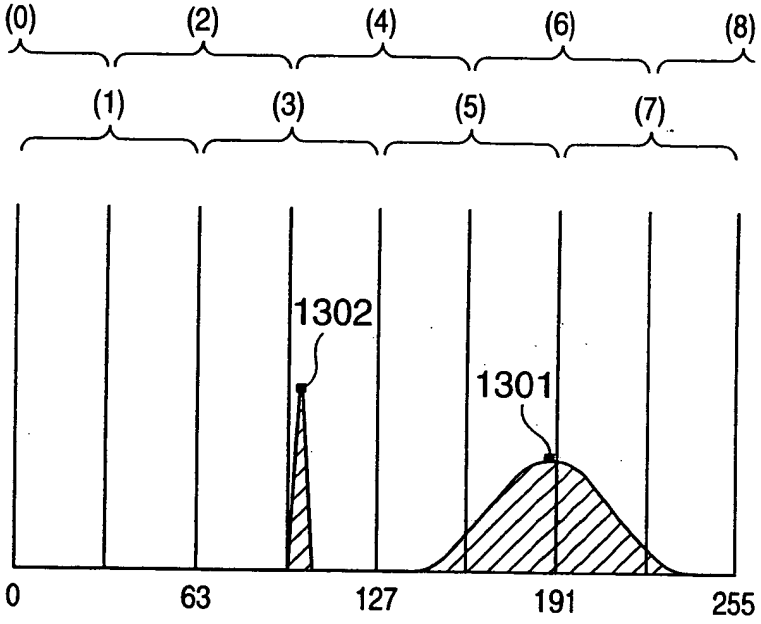
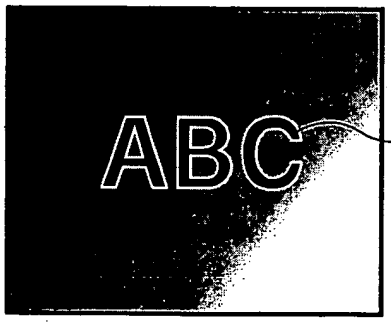


FIG. 14A

FIG. 14B

REPRESENTATIVE
COLOR DATA
R=20,G=30,B=225

FIG. 14C



BLUE OF (20,30,225)

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FIG. 15

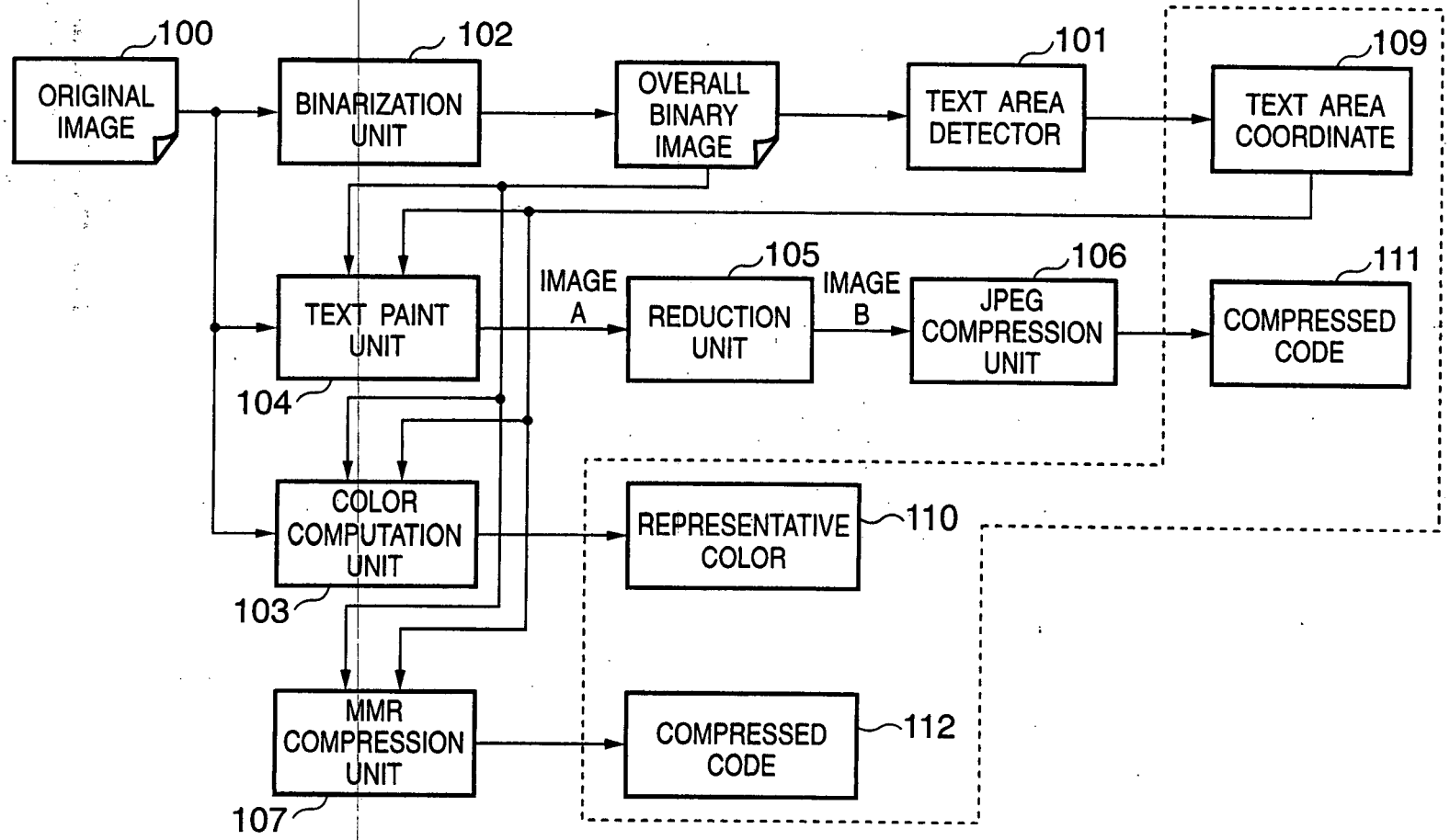

100
ORIGINAL IMAGE
102
BINARIZATION UNIT
OVERALL BINARY IMAGE
101
TEXT AREA DETECTOR
109
TEXT AREA COORDINATE
TEXT PAINT UNIT
104
IMAGE A
105
REDUCTION UNIT
IMAGE B
106
JPEG COMPRESSION UNIT
111
COMPRESSED CODE
COLOR COMPUTATION UNIT
103
REPRESENTATIVE COLOR
110
MMR COMPRESSION UNIT
107
COMPRESSED CODE
112

FIG. 16

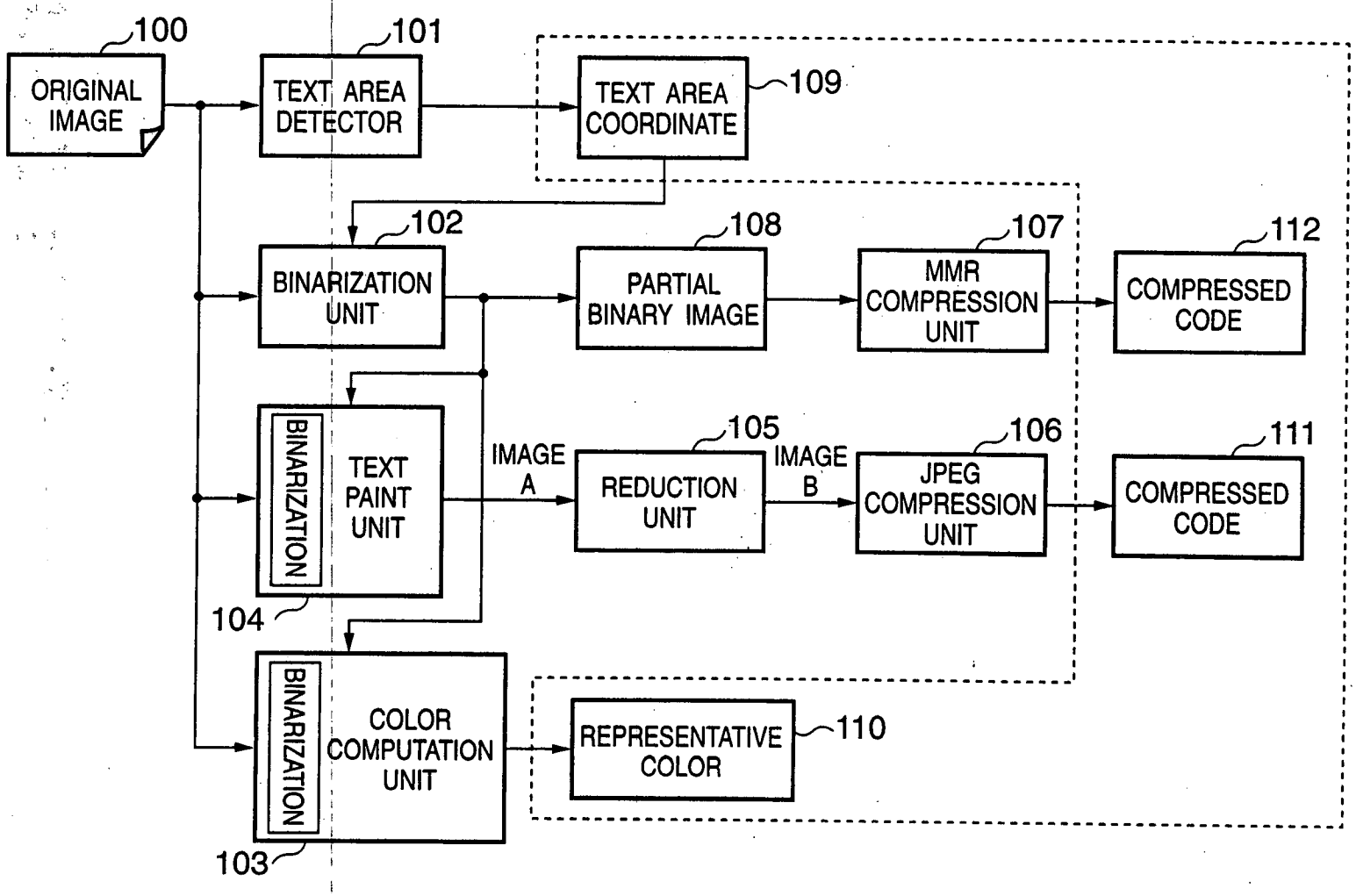

100
ORIGINAL IMAGE
101
TEXT AREA DETECTOR
TEXT AREA COORDINATE
109
102
BINARIZATION UNIT
108
PARTIAL BINARY IMAGE
107
MMR COMPRESSION UNIT
112
COMPRESSED CODE
BINARIZATION
TEXT PAINT UNIT
104
IMAGE A
105
REDUCTION UNIT
IMAGE B
106
JPEG COMPRESSION UNIT
111
COMPRESSED CODE
BINARIZATION
COLOR COMPUTATION UNIT
103
REPRESENTATIVE COLOR
110

FIG. 17

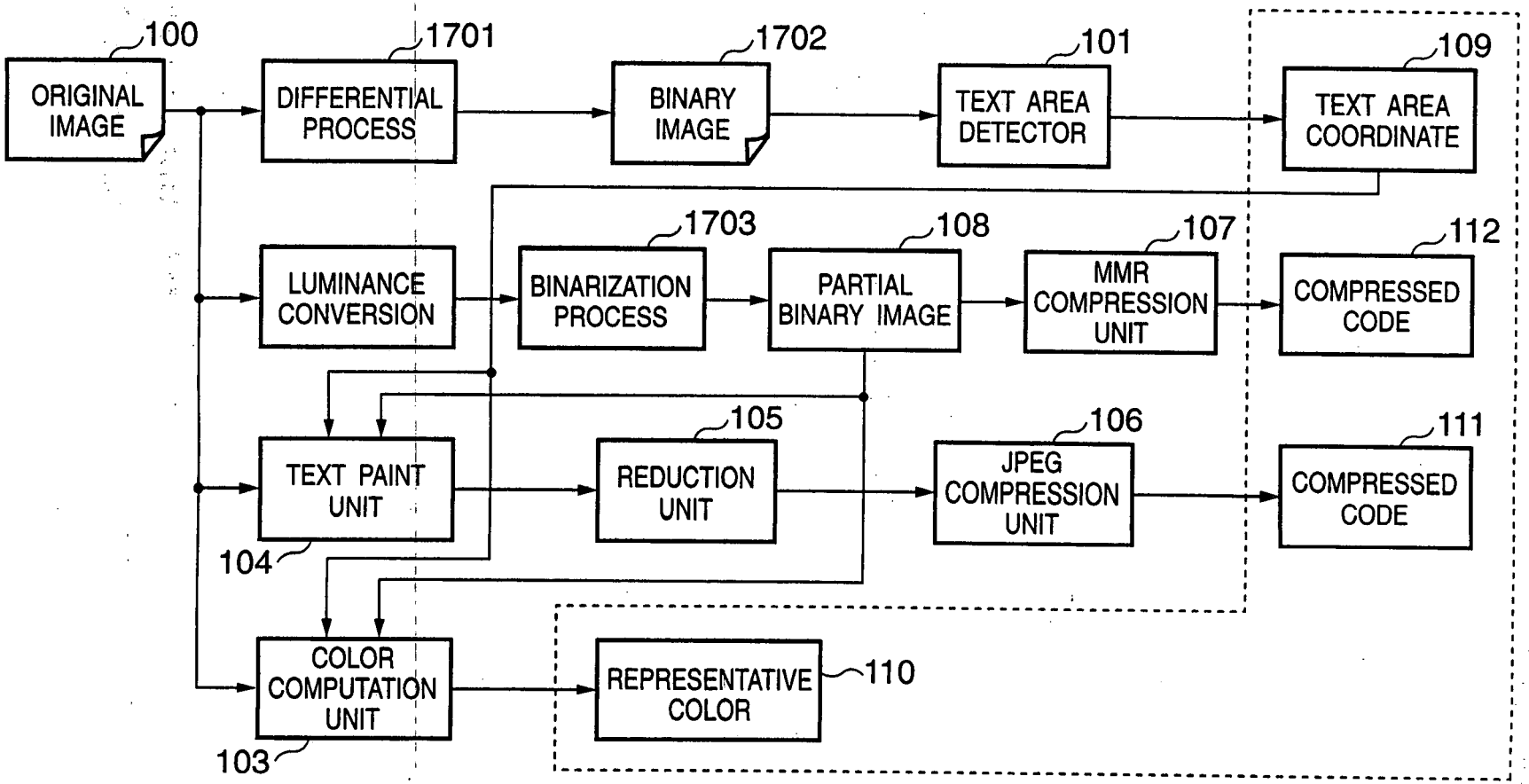
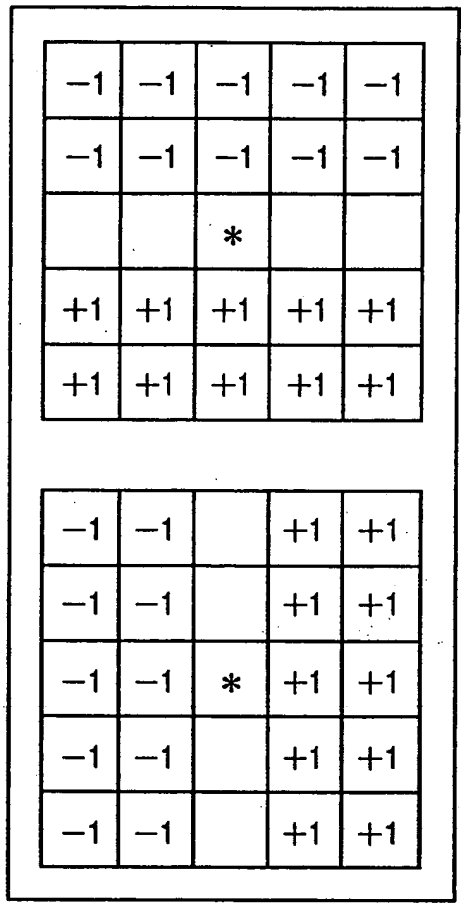

100
ORIGINAL IMAGE
1701
DIFFERENTIAL PROCESS
1702
BINARY IMAGE
101
TEXT AREA DETECTOR
109
TEXT AREA COORDINATE
1703
LUMINANCE CONVERSION
BINARIZATION PROCESS
108
PARTIAL BINARY IMAGE
107
MMR COMPRESSION UNIT
112
COMPRESSED CODE
105
TEXT PAINT UNIT
REDUCTION UNIT
106
JPEG COMPRESSION UNIT
111
COMPRESSED CODE
104
COLOR COMPUTATION UNIT
REPRESENTATIVE COLOR
110
103

FIG. 18A



−1	−1	−1	−1	−1
−1	−1	−1	−1	−1
		*		
+1	+1	+1	+1	+1
+1	+1	+1	+1	+1

−1	−1		+1	+1
−1	−1		+1	+1
−1	−1	*	+1	+1
−1	−1		+1	+1
−1	−1		+1	+1

FIG. 18B

−1	−1	−1
−1	8	−1
−1	−1	−1

FIG. 19A

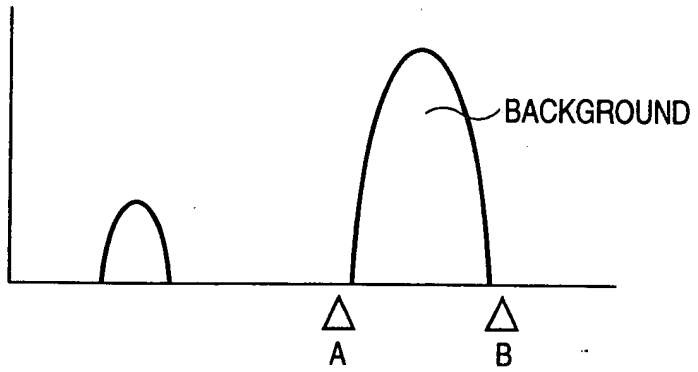


FIG. 19B

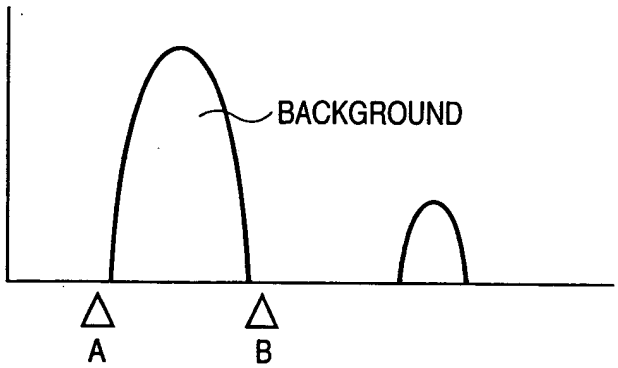


FIG. 19C

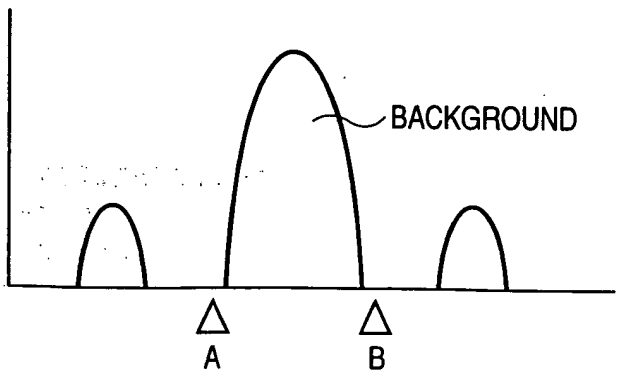


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FIG. 20

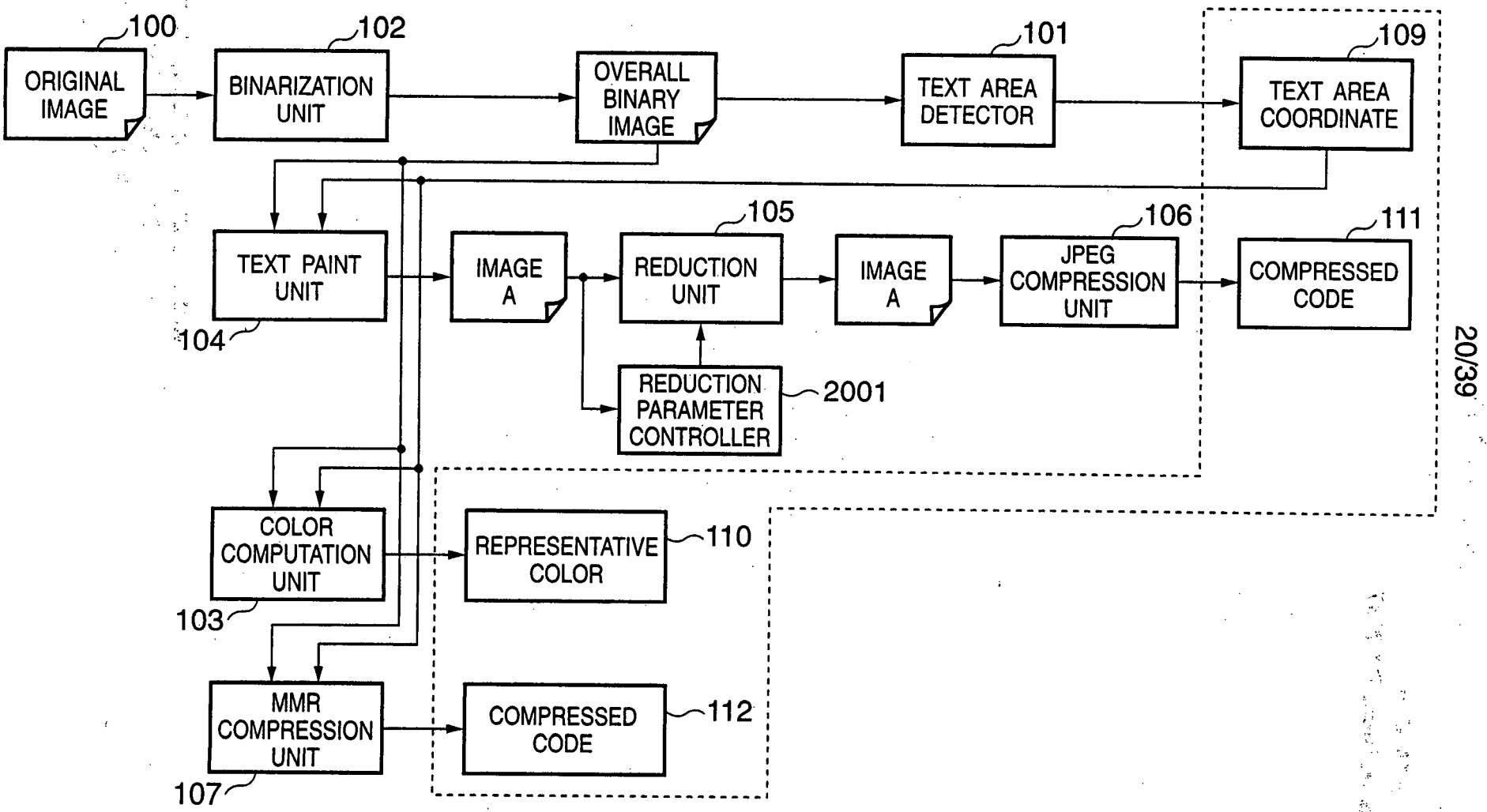
100
ORIGINAL IMAGE
102
BINARIZATION UNIT
OVERALL BINARY IMAGE
101
TEXT AREA DETECTOR
109
TEXT AREA COORDINATE
TEXT PAINT UNIT
104
IMAGE A
105
REDUCTION UNIT
IMAGE A
106
JPEG COMPRESSION UNIT
111
COMPRESSED CODE
REDUCTION PARAMETER CONTROLLER
2001
COLOR COMPUTATION UNIT
103
REPRESENTATIVE COLOR
110
MMR COMPRESSION UNIT
107
COMPRESSED CODE
112

FIG. 21

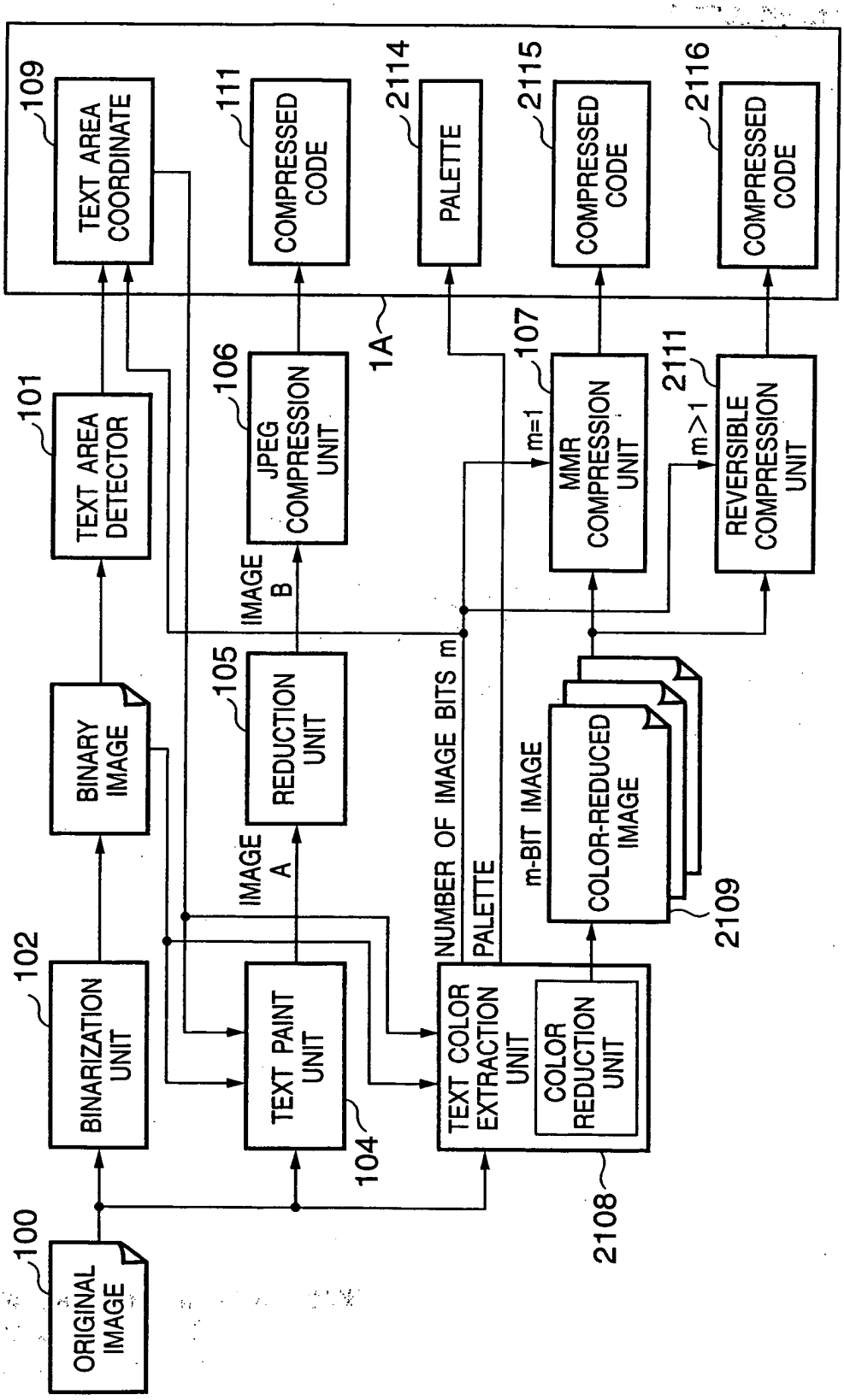
ORIGINAL IMAGE
100
BINARIZATION UNIT
102
BINARY IMAGE
TEXT AREA DETECTOR
101
TEXT AREA COORDINATE
109
IMAGE A
REDUCTION UNIT
105
TEXT PAINT UNIT
104
IMAGE B
JPEG COMPRESSION UNIT
106
COMPRESSED CODE
111
1A
NUMBER OF IMAGE BITS m
PALETTE
TEXT COLOR EXTRACTION UNIT
COLOR REDUCTION UNIT
2108
PALETTE
2114
m-BIT IMAGE
COLOR-REDUCED IMAGE
2109
m=1
MMR COMPRESSION UNIT
107
COMPRESSED CODE
2115
m>1
REVERSIBLE COMPRESSION UNIT
2111
COMPRESSED CODE
2116

FIG. 22

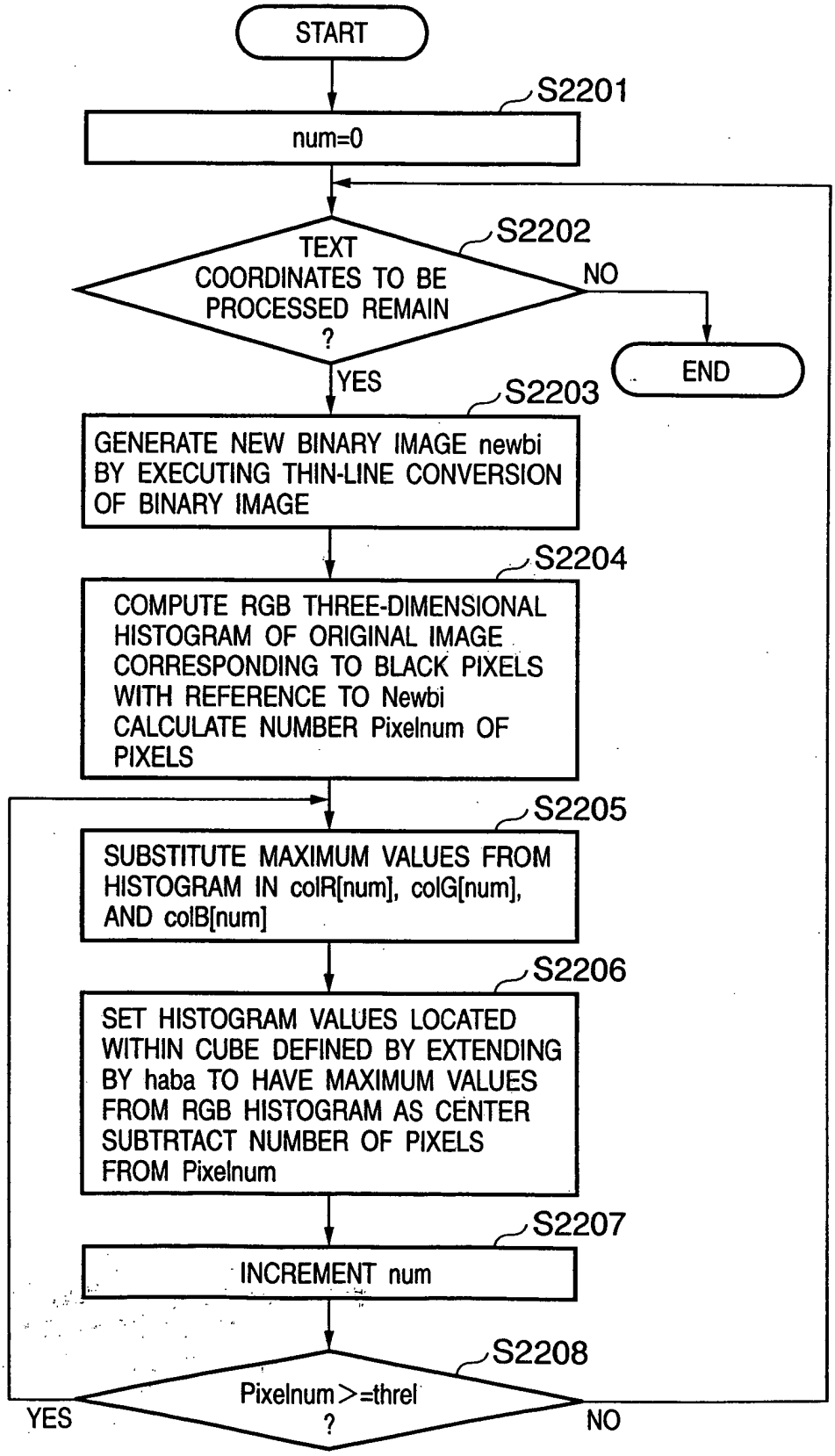

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FIG. 23

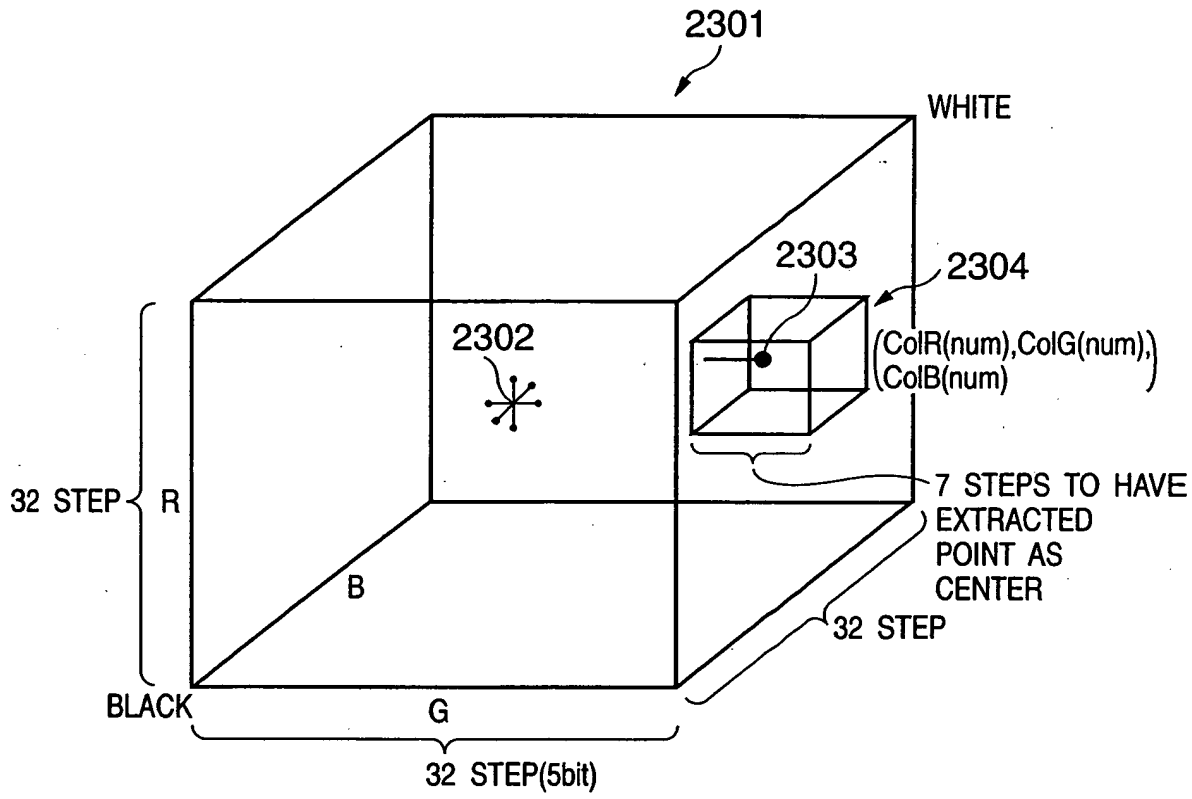
2301
WHITE
2303
2304
2302
(ColR(num),ColG(num),
ColB(num)
32 STEP
R
B
7 STEPS TO HAVE
EXTRACTED
POINT AS
CENTER
32 STEP
BLACK
G
32 STEP(5bit)

FIG. 24

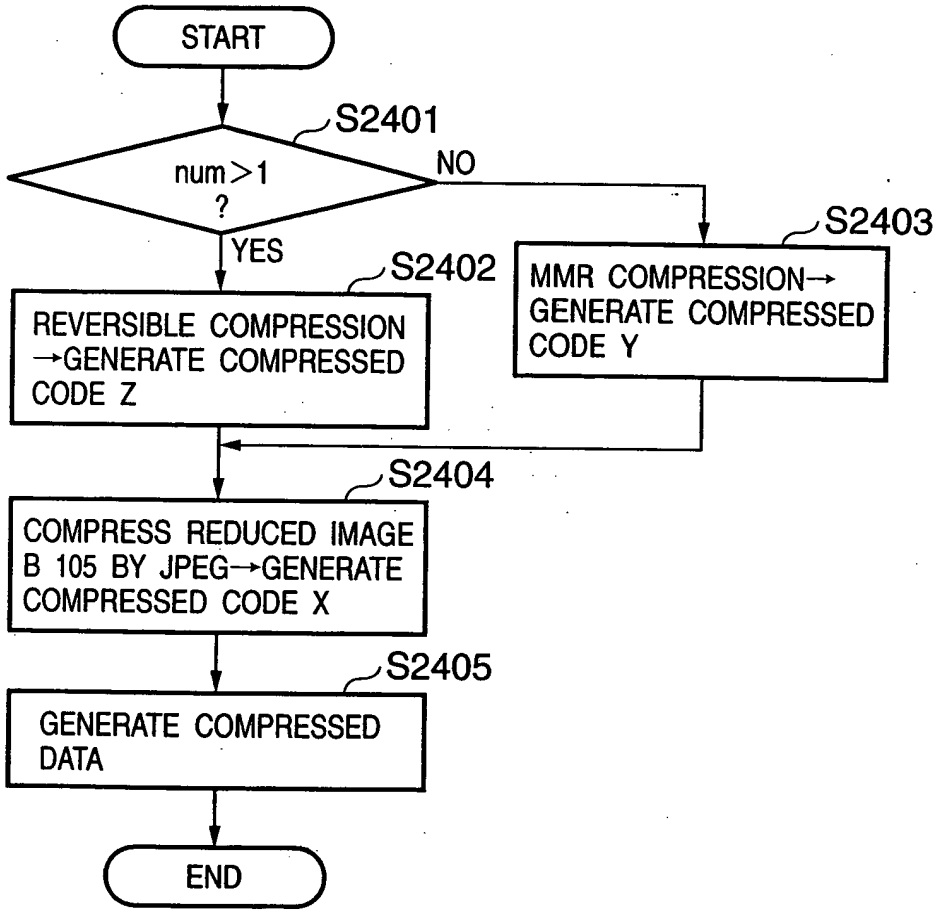

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FIG. 25

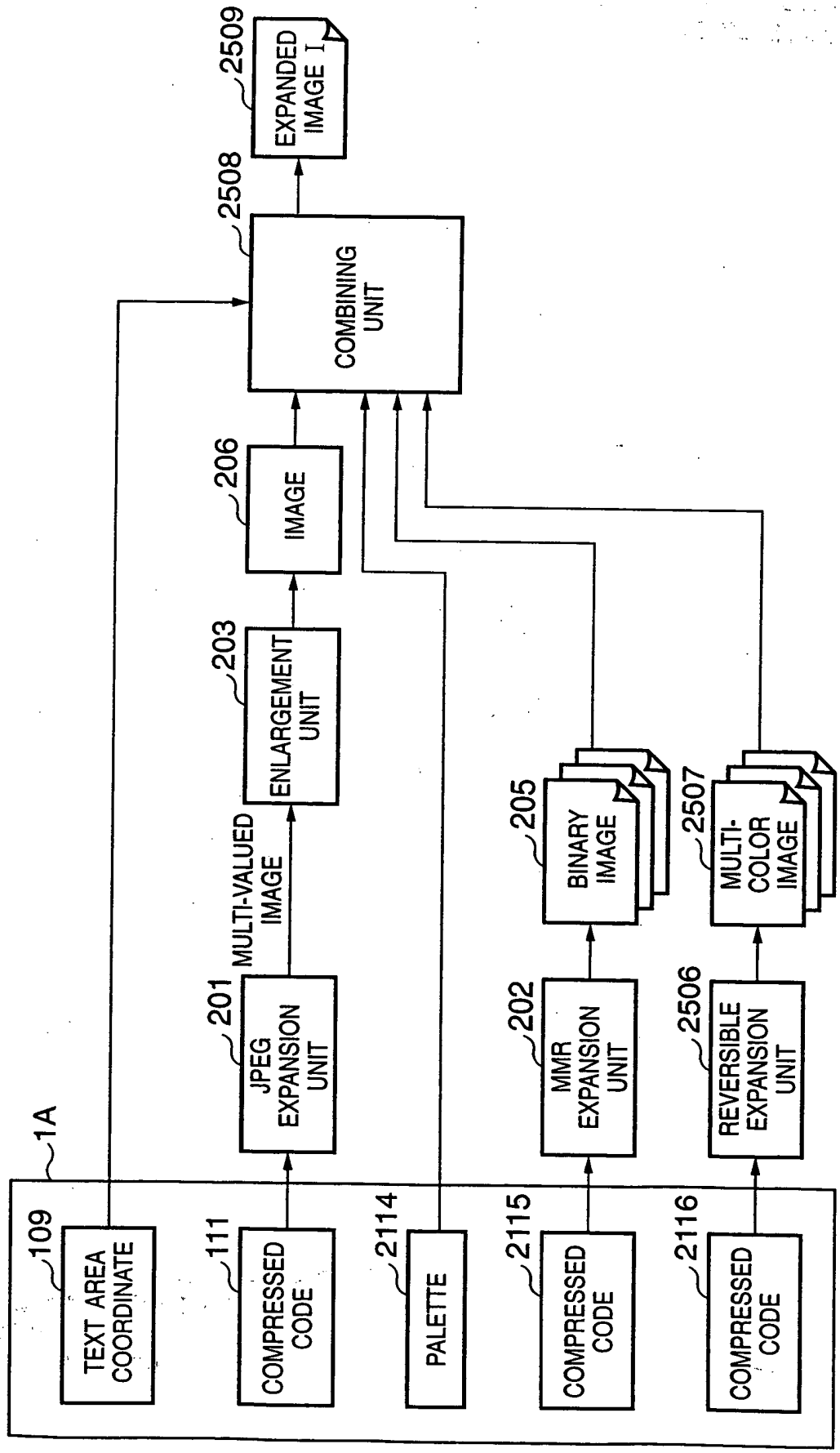

FIG. 26

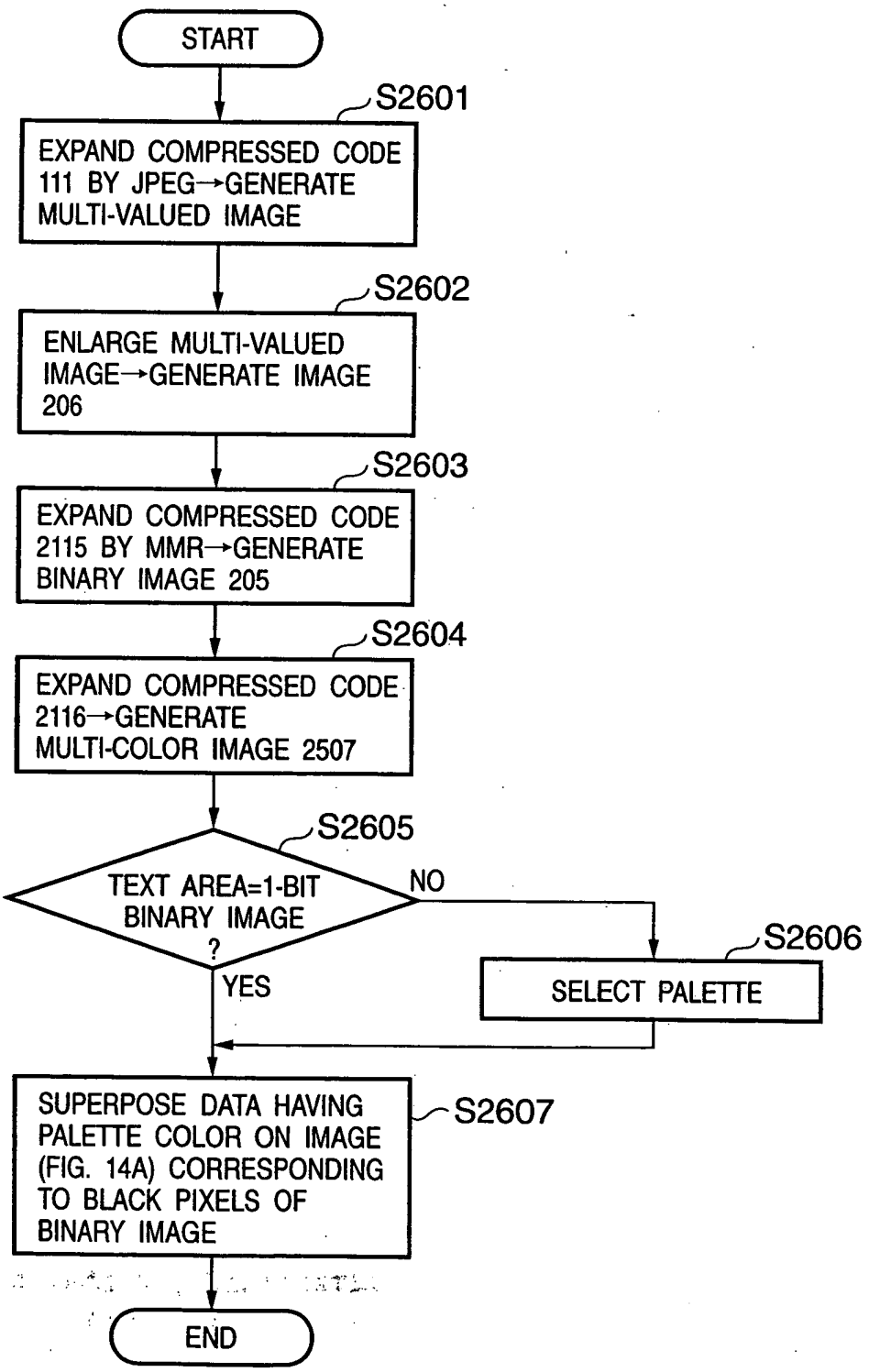
START
S2601
EXPAND COMPRESSED CODE 111 BY JPEG→GENERATE MULTI-VALUED IMAGE
S2602
ENLARGE MULTI-VALUED IMAGE→GENERATE IMAGE 206
S2603
EXPAND COMPRESSED CODE 2115 BY MMR→GENERATE BINARY IMAGE 205
S2604
EXPAND COMPRESSED CODE 2116→GENERATE MULTI-COLOR IMAGE 2507
S2605
TEXT AREA=1-BIT BINARY IMAGE ?
NO
YES
S2606
SELECT PALETTE
SUPERPOSE DATA HAVING PALETTE COLOR ON IMAGE (FIG. 14A) CORRESPONDING TO BLACK PIXELS OF BINARY IMAGE
S2607
END

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FIG. 27

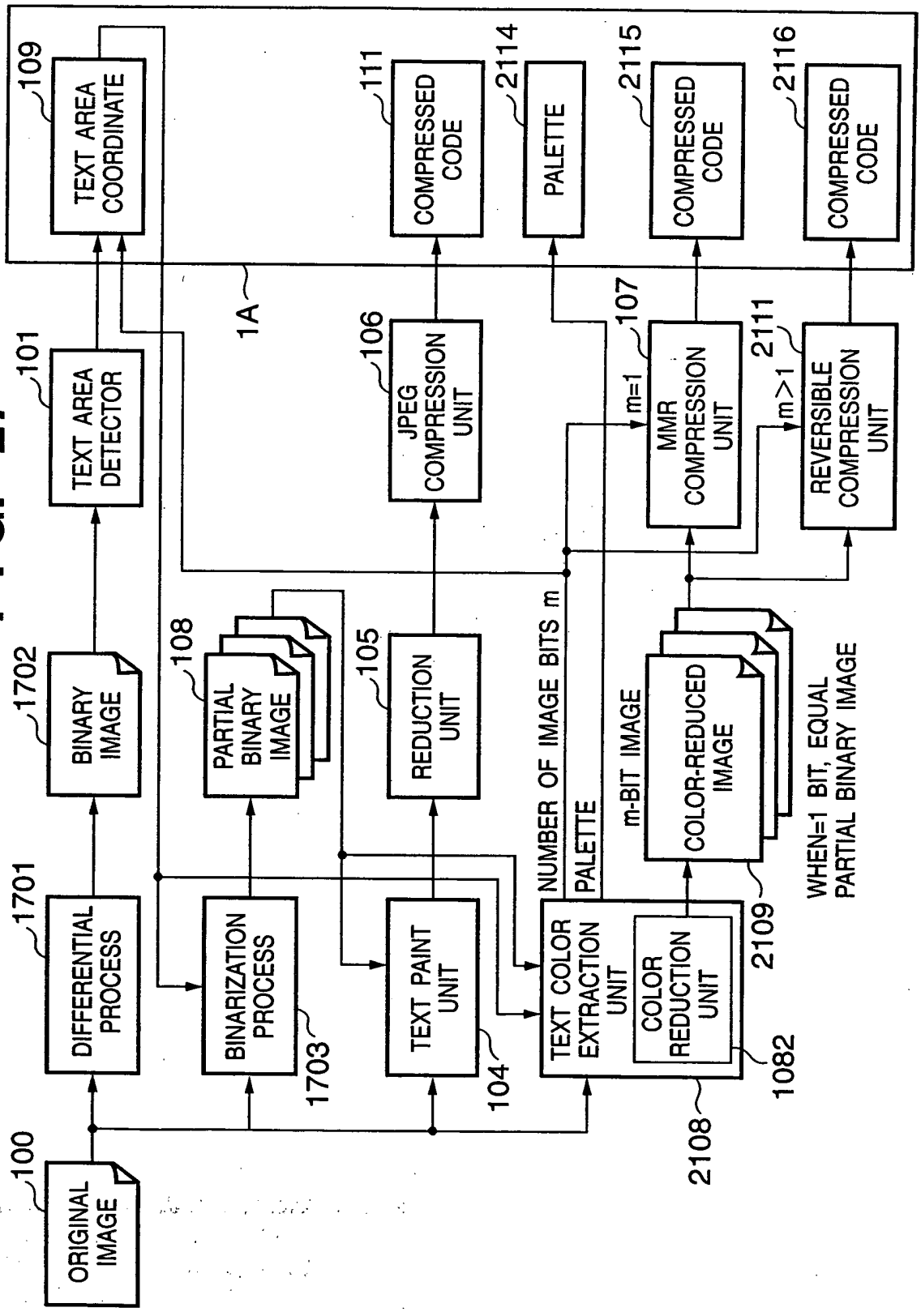

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FIG. 28

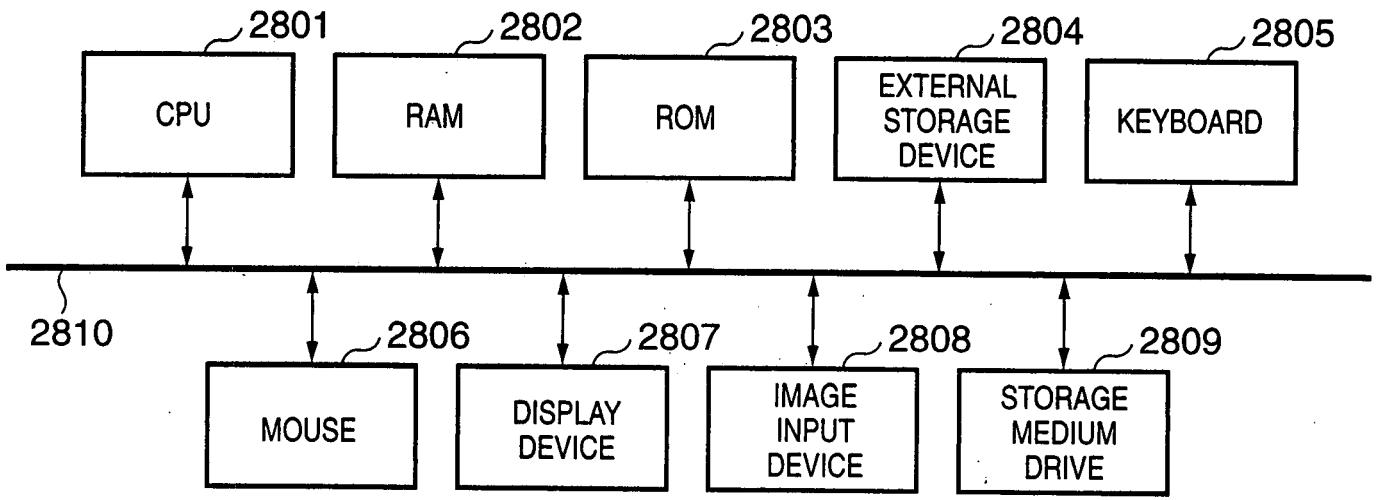

FIG. 29

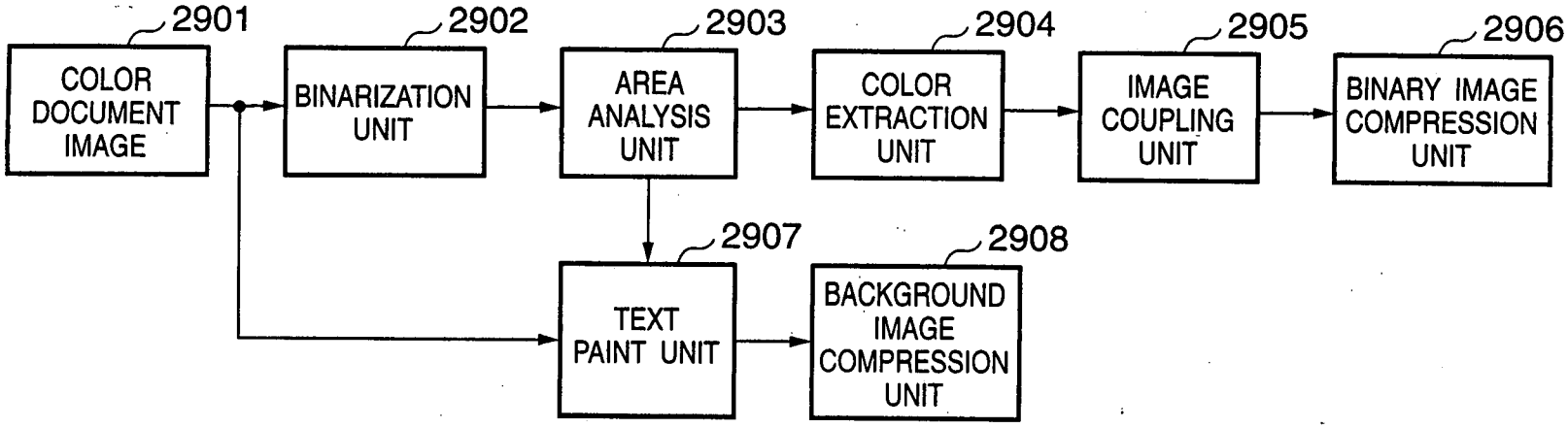
2901
COLOR DOCUMENT IMAGE
2902
BINARIZATION UNIT
2903
AREA ANALYSIS UNIT
2904
COLOR EXTRACTION UNIT
2905
IMAGE COUPLING UNIT
2906
BINARY IMAGE COMPRESSION UNIT
2907
TEXT PAINT UNIT
2908
BACKGROUND IMAGE COMPRESSION UNIT

FIG. 30A

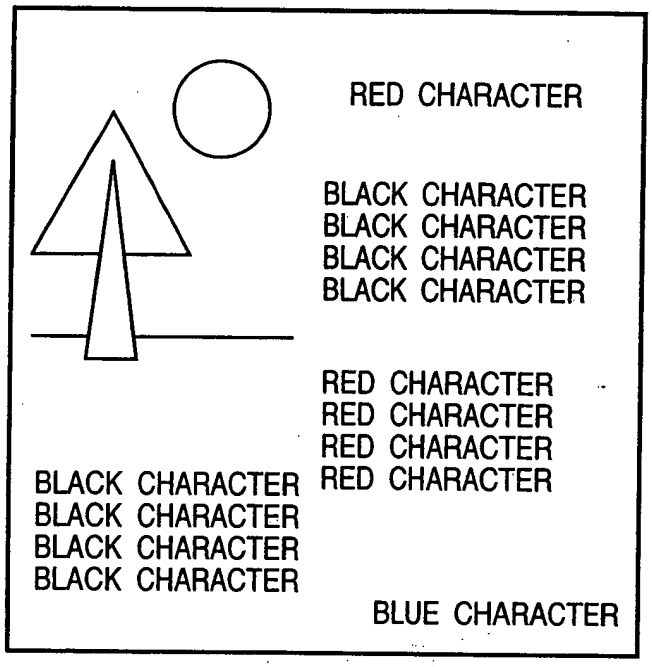

FIG. 30B

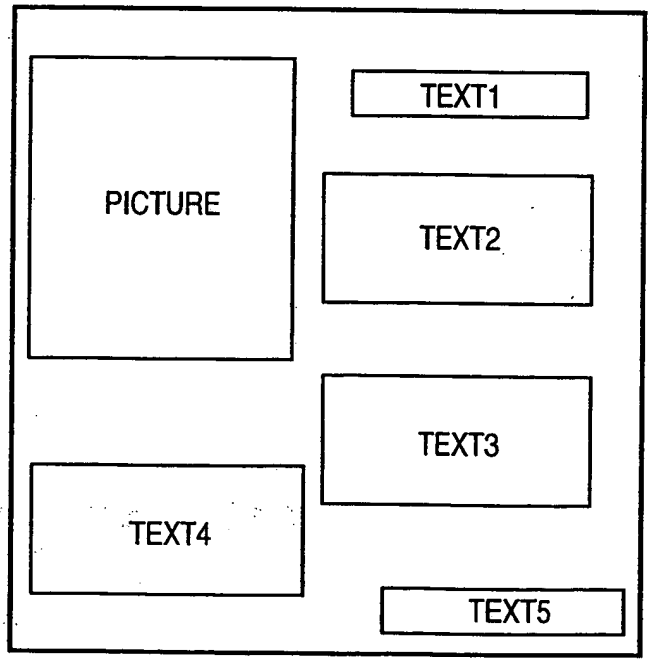

FIG. 30C

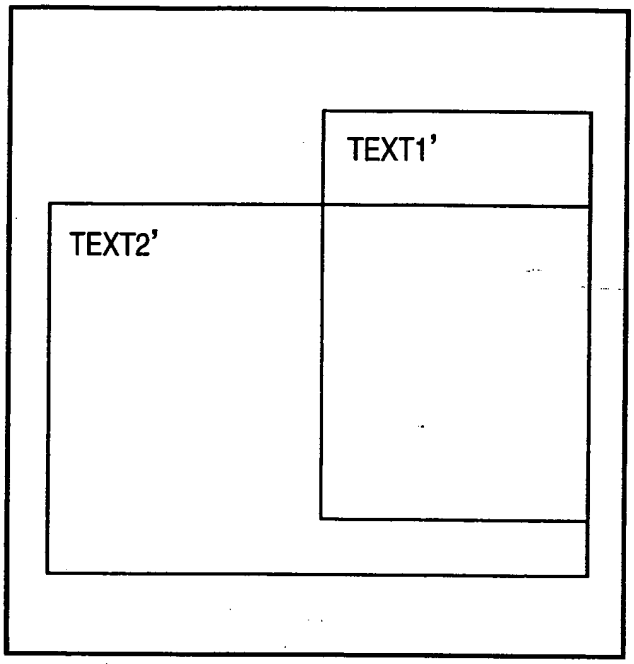

FIG. 30D

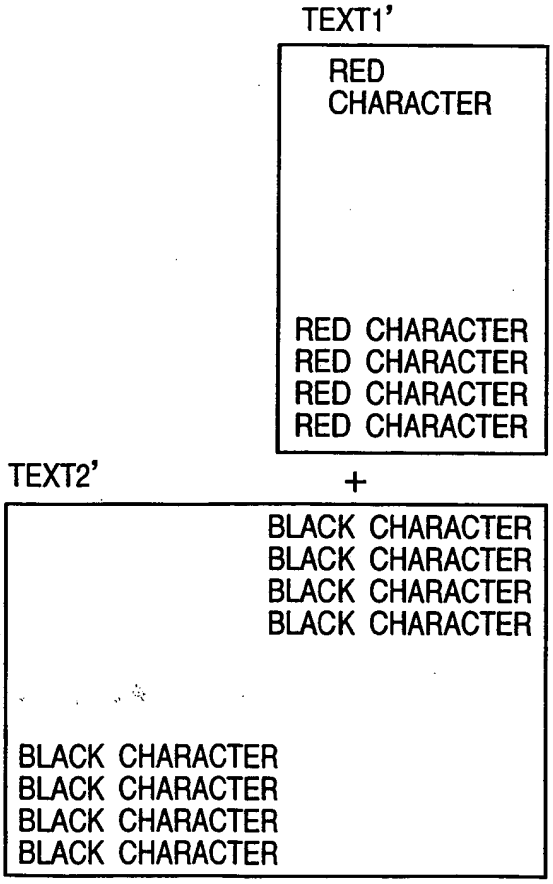

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FIG. 30E

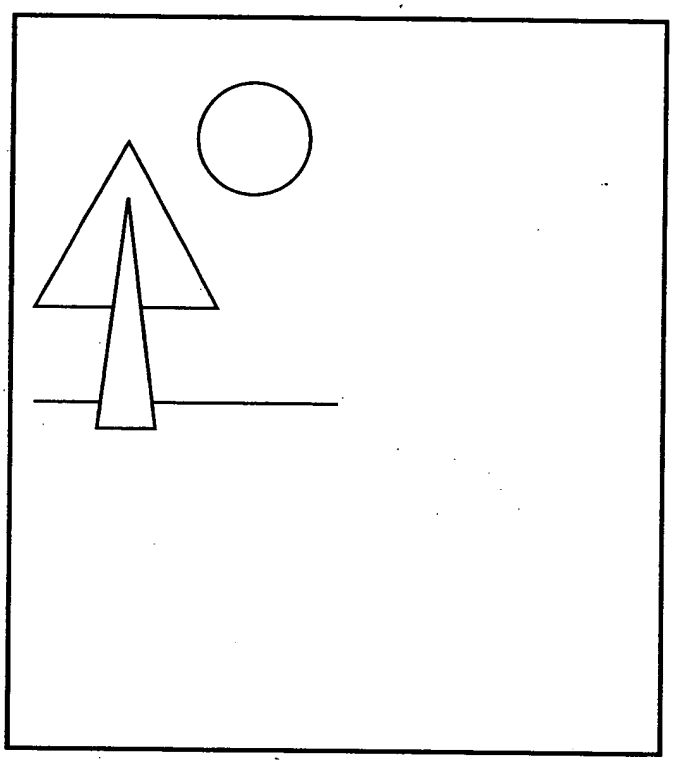

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FIG. 31

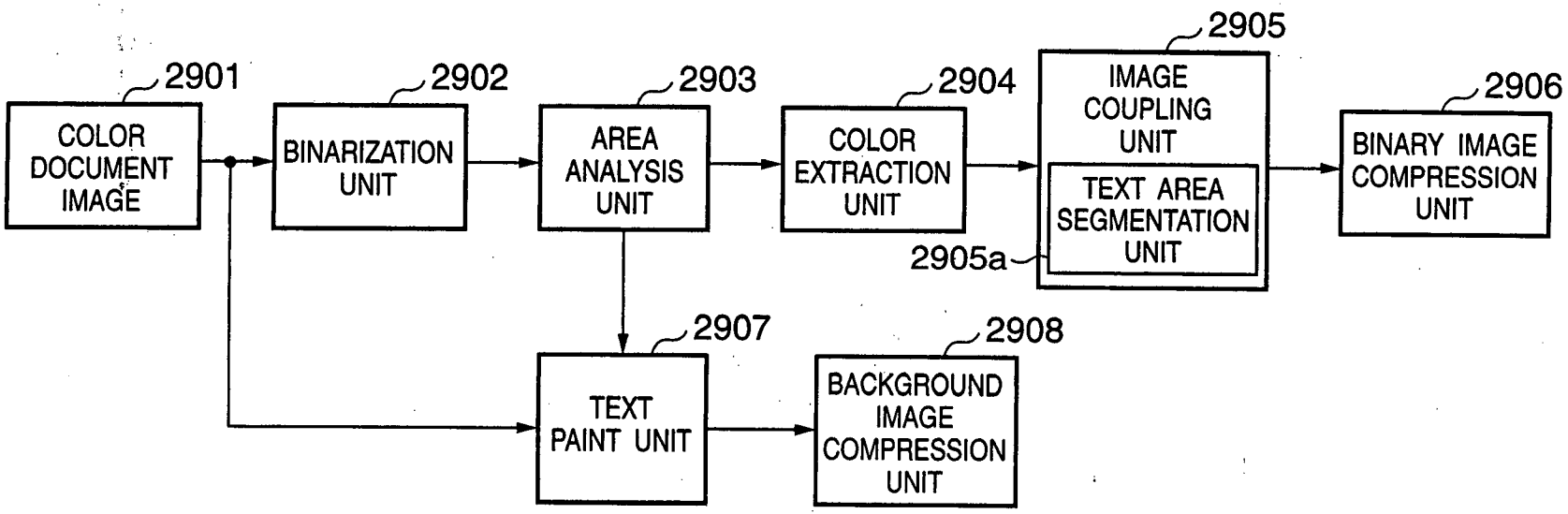

2901
COLOR DOCUMENT IMAGE
2902
BINARIZATION UNIT
2903
AREA ANALYSIS UNIT
2904
COLOR EXTRACTION UNIT
2905
IMAGE COUPLING UNIT
TEXT AREA SEGMENTATION UNIT
2905a
2906
BINARY IMAGE COMPRESSION UNIT
2907
TEXT PAINT UNIT
2908
BACKGROUND IMAGE COMPRESSION UNIT

FIG. 32A

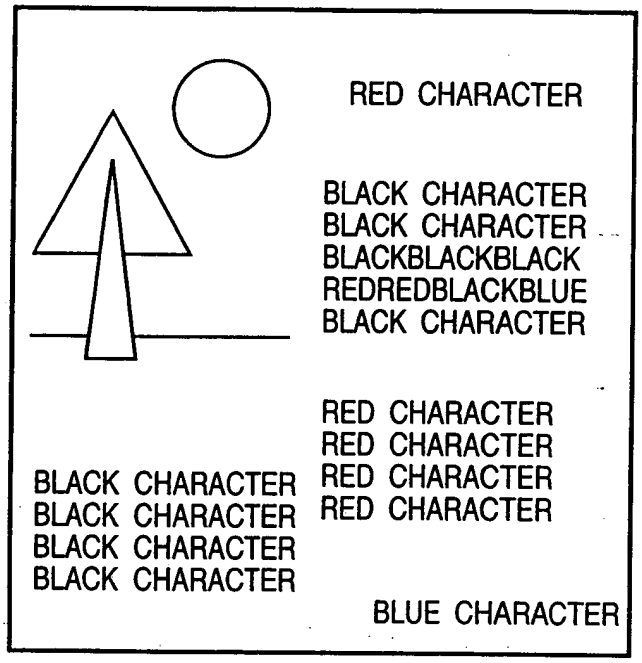
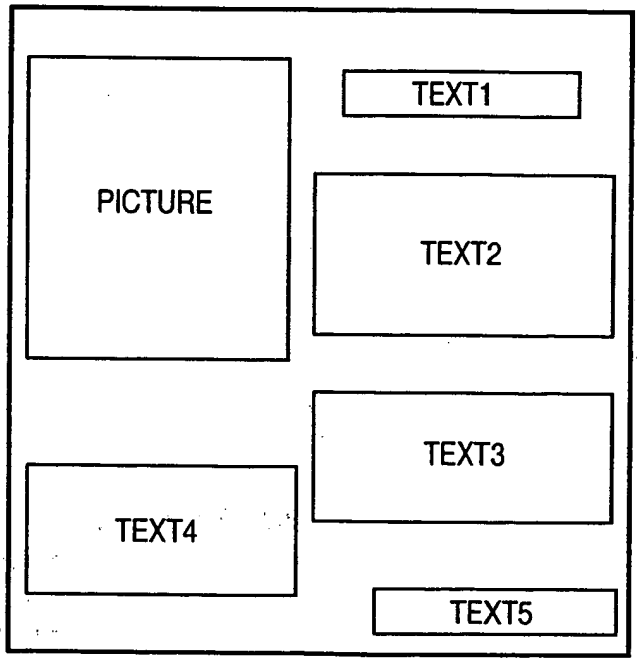


FIG. 32B



EP 0 680 068 A2

FIG. 32C

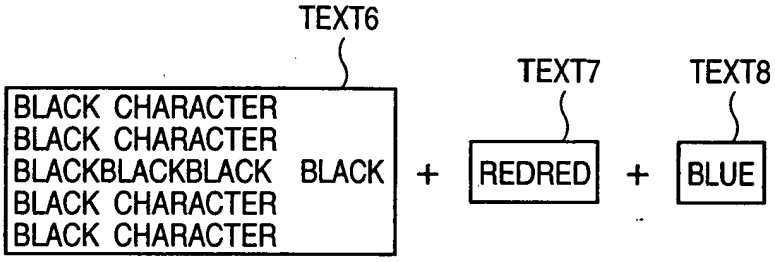
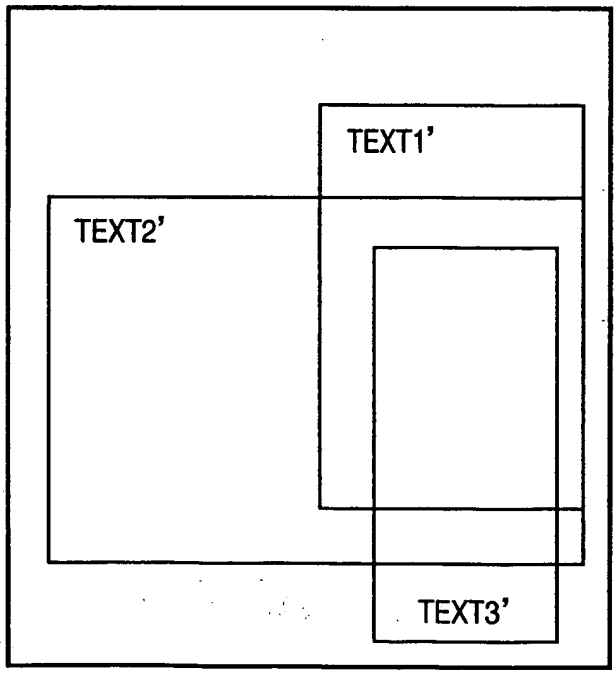


FIG. 32D



EP0280 066 60

FIG. 32E

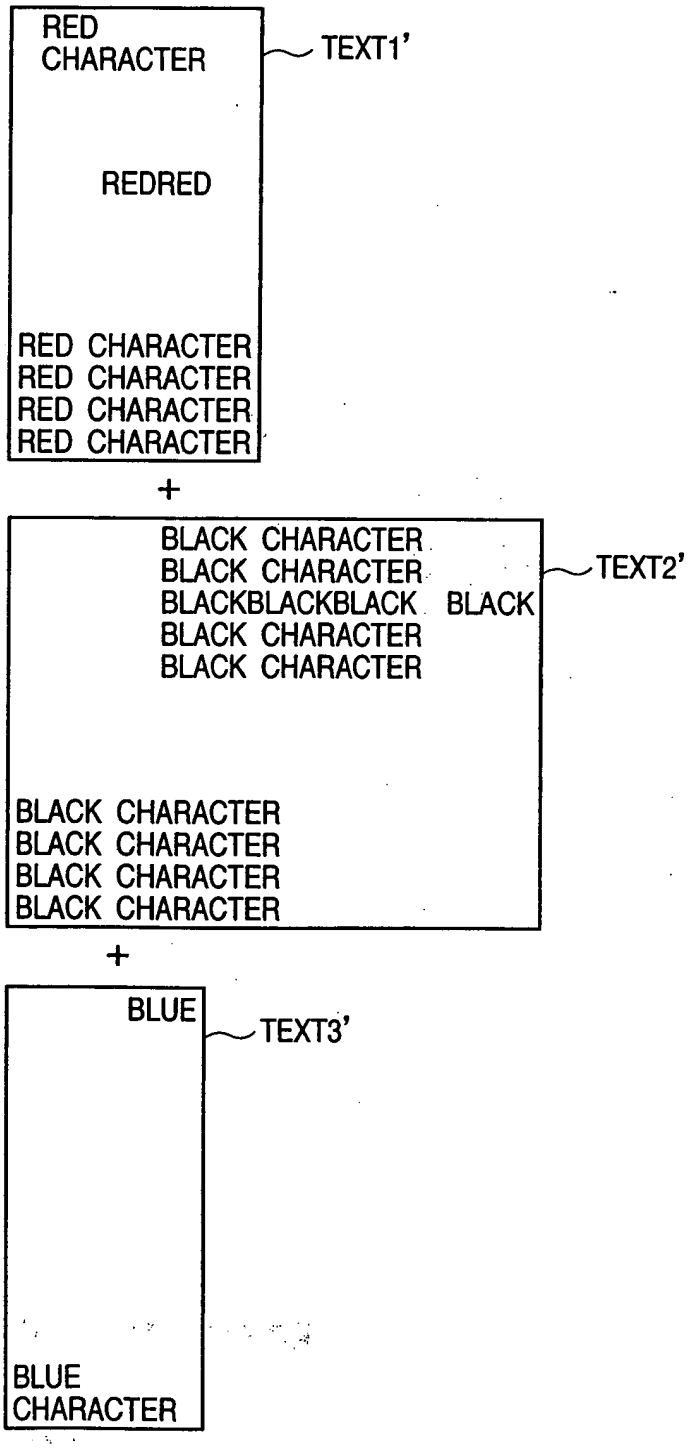
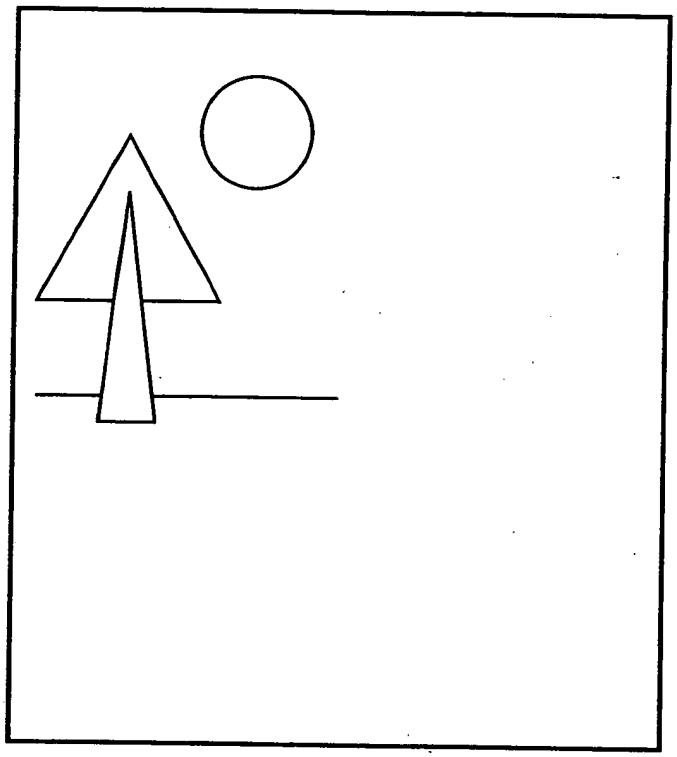
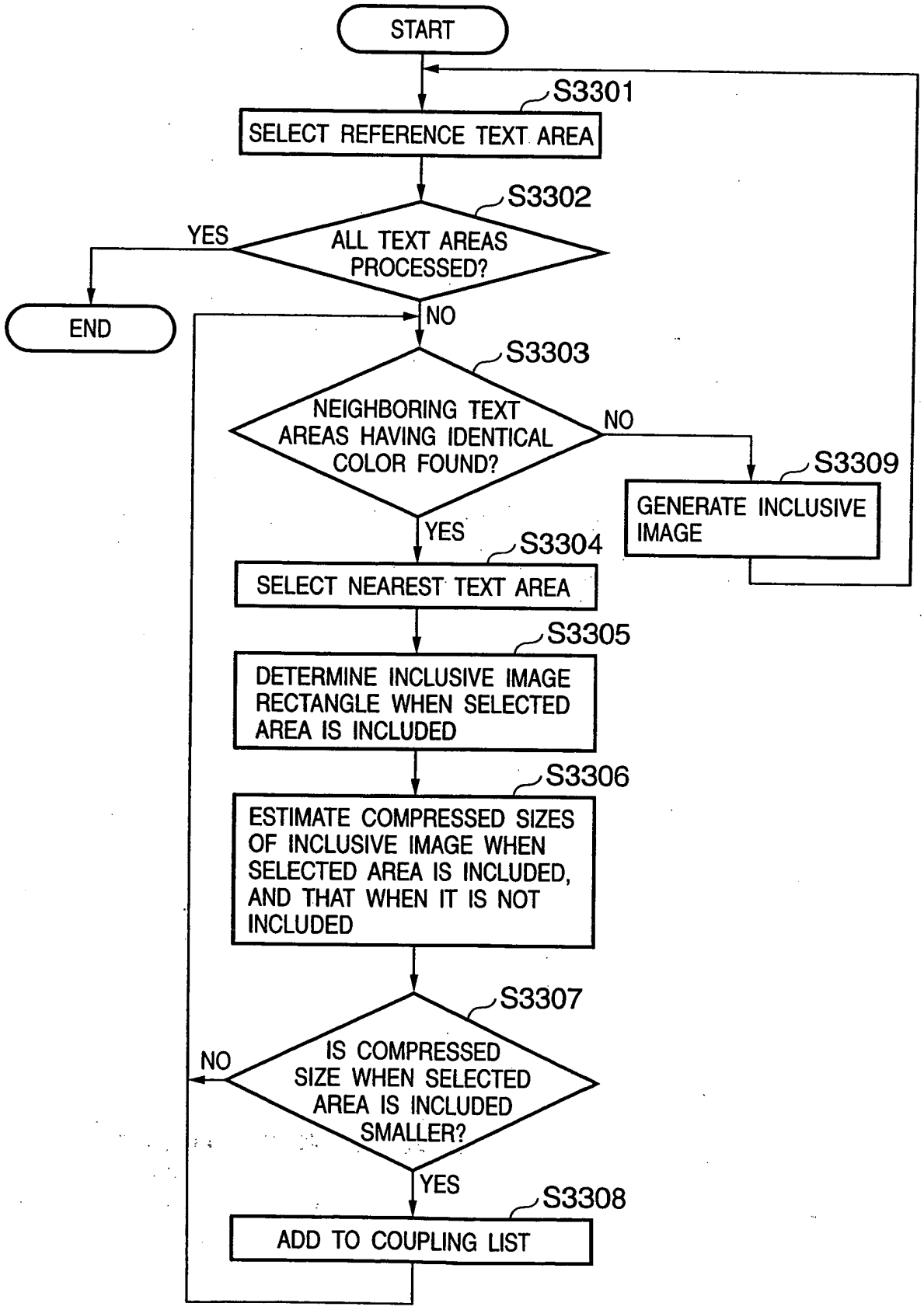

RED
CHARACTER
TEXT1'
REDRED
RED CHARACTER
RED CHARACTER
RED CHARACTER
RED CHARACTER
+
BLACK CHARACTER
BLACK CHARACTER
BLACKBLACKBLACK BLACK
BLACK CHARACTER
BLACK CHARACTER
TEXT2'
BLACK CHARACTER
BLACK CHARACTER
BLACK CHARACTER
BLACK CHARACTER
+
BLUE
TEXT3'
BLUE
CHARACTER

FIG. 32F



EP 0 802 504 A1

FIG. 33



EP 0 680 003 A2

FIG. 34

	TEXT2
TEXT1	0
TEXT2	999
TEXT3	0
TEXT4	1
TEXT5	0

EP 0 280 068 A2